Internet. End user access to multiple ISPs, multiple e-commerce sites, and the large variety of other Internet services has introduced a sort of iterative trial and error process. This process, which creates lessons for both users and suppliers through frequent interaction, allows a quickening of Internet innovation. Consequently, providing open access takes on particular importance in this case. The current conditions within the market provide vertically-integrated broadband cable operators few incentives to innovate. Vertically integrated network/ISPs can directly control the price of broadband Internet service. If the network owner allows competing ISPs to gain access to its system, it loses control of pricing and output since the integrated network owner would not set end users' prices. Instead, each individual ISP would have the ability to set its own price. Despite the network owner's ability to control the price charged by individual ISPs, a network owner still has significant market power and can keep prices high.[8] However, under a market-based system, the monopolist will strongly prefer the integrated single supplier system and negotiated access is not likely to be effective.

B. Price Regulation

16. As explained above, in the absence of price regulation, the existence of multiple ISPs does not necessarily eliminate the possibility that a monopolist could earn above-competitive profits. The unregulated broadband network potentially

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The "cost" in this context includes both out-of-pocket operating costs and capital costs (i.e., depreciation and a return on investor-supplied funds commensurate with the risk of the enterprise).

[8] A rigorous theoretical exercise can show that a monopolist can still dictate the final price to end users even with multiple ISPs. This can be achieved by the monopolist establishing an access charge that is set just equal to the monopoly price that would prevail under the integrated market *less* the ISP's costs. With such a charge, the ISP's cost to serve end users is equal to the monopoly price under integration. With competing ISPs, no ISP can raise their price above their costs. These results appear to suggest that the monopolist would be indifferent between a single integrated supplier and multiple competing suppliers. However, this is a "knife's edge" condition and even the slightest cost to the monopolist from allowing access will dissuade the monopolist from negotiating to allow multiple suppliers.

would allow an owner to price in a manner that allows it to earn profits that are higher than that necessary to ensure the financial viability of the network. By restricting the pricing power of the broadband network owner through price regulation, broadband Internet access prices would decline to the level of the cost of providing network service. This would create a wider demand for the service and benefit consumers while still ensuring the viability of the network owner and preserving incentives to invest.

C. *Open Access*

17. Similar to price regulation, open access to the network would also provide critical economic benefits. As explained above, the integrated network owner lacks incentives to allow access voluntarily.[9] Therefore, public policy should ensure non-discriminatory access by ISPs.[10] With effective competition at the ISP level (induced by open access) in tandem with regulated access charges, consumers will receive broadband Internet access at the lowest possible cost. Consequently, effective open-access ISP policies are essential. However, the integration between a network owner and an ISP creates incentives that cut against the goal of open access (and provision of broadband Internet access at the lowest possible cost). Open access works when ISPs using the broadband network are treated in a comparable manner. When a broadband network owner is integrated with an ISP, the network owner has a vested interest in the commercial success of its affiliate. The incentive problems associated with this kind of

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[9] Some terms demanded by Time Warner in negotiation with ISPs indicate that cable owners maybe motivated in this way. The terms included: • 75 percent of the Internet service providers' revenue from all subscriber fees—which are often their biggest source of sales; • 25 percent of the Internet service providers' revenue from other sources--such as advertising and other e-commerce fees; • a $50,000 as an upfront deposit; • approval control over the Internet service providers' home pages.

[10] By non-discrimination, we mean the network monopolist is not permitted to offer different prices, terms, and other conditions to similarly situated ISPs.

arrangement are well known. Basically, the integration provides the network owner with vertical market power. Vertical market power is the ability to exert market power in a downstream market as a result of the control of an essential input. This is known as vertical foreclosure.[11]

18. Additionally, investment decisions can be undertaken that benefit one ISP over others. For example, it is possible, at the discretion of the cable franchise, that benefits such as speed and capacity of the system be offered as incentives for those end users who chose the affiliated ISP. While this undermines competition, it is made even worse by the fact that the costs of these investments, under typical regulatory methods, would be allocated among all network users.

19. A regulated enterprise that maintains an unregulated affiliate will have the incentive to report costs incurred by the affiliate as costs to support the regulated activities. For example, executive salaries and other corporate costs and facilities are used to support both the regulated activities as well as the activities of the unregulated affiliate. If the network owner is able to shift costs away from its unregulated affiliate ISP in a regulatory environment and thereby reduce its affiliate's costs, then competing ISPs will be faced with an unfair disadvantage. This is the antithesis of competition --

[11] Vertical foreclosure can arise in at least two ways in the broadband Internet access market. First, the integrated network owner can use its operational and managerial control of the network in a manner that puts unaffiliated ISPs at a disadvantage. The most serious problems arise if the network owner is able to use managerial discretion over operating and investment decisions to provide advantages over rivals. The cable system is a network system that must be shared but which also must be allocated at key junctures. For example, signals from end users sent back over the network out to the Internet must use switches and routers in order to ensure that the end users' ISPs receive proper signals. If a network is not properly configured (or is configured purposefully to favor one ISP over others), the network's affiliated ISP may be able to gain priority access that speeds-up its service relative to its competitors' service or it may simply degrade the perceived reliability of rival ISPs. This effectively allows the network owner to improve the quality of the affiliated ISP product by virtue of controlling the essential facility. The monitoring of such activity is difficult and the opportunity for competitive mischief is high.

not only do unaffiliated competitors face an ISP who has artificially lower costs, but the costs are hoisted onto the network which must be paid for by the unaffiliated ISPs. Hence, the anticompetitive activities are being financed by the entities that suffer the consequences.

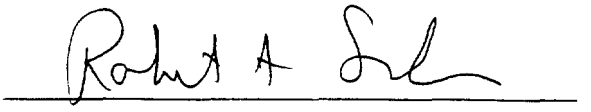
20. It is important to recognize that the potential for this kind of activity exists. In order to ensure competitive broadband Internet open-access strong open-access policies must be established. The terms and condition should ensure that operational decisions and investments are made in a pro competitive fashion. This will enable competition at the ISP level and allow the attendant cost and technology benefits.

V. SUMMARY AND CONCLUSIONS

21. The most efficient way to provide residential broadband Internet access is to allow multiple ISPs to offer competitive portal services using a common broadband network. This is best accomplished by means of regulated access rates and open-access policies, including an independent network operator. This approach is superior to market-based approaches and superior to continued operation of the system by the cable owners under open-access tariffs.

I declare under penalty of perjury under the laws of the District of Columbia that the foregoing is true and correct.

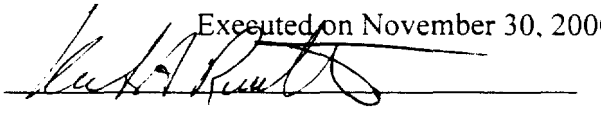
Executed on November 30, 2000, at Washington, D.C.



Robert A. Sinclair

I declare under penalty of perjury under the laws of the District of Columbia that the foregoing is true and correct.

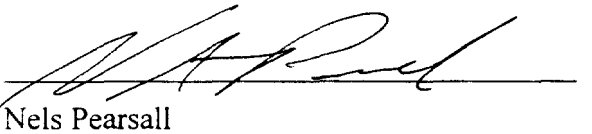
Executed on November 30, 2000, at Washington, D.C.



Keith A. Reutter

I declare under penalty of perjury under the laws of the District of Columbia that the foregoing is true and correct.

Executed on November 30, 2000, at Washington, D.C.



Nels Pearsall

MICRONOMICS
AN INTERCAP COMPANY

ROBERT A. SINCLAIR
Director

Education

Ph.D., Economics, University of Pittsburgh (1993)

M.A., Economics, University of Pittsburgh (1988)

B.A., Economics (minor in Mathematics), Indiana University of Pennsylvania (1986)

Fields of Concentration

Applied Microeconomics, Law and Economics, Empirical Industrial Organization

Expert Testimony

Before the Superior Court of the State of Arizona in and for the County of Santa Cruz

Sam and Sherri Chilcote, *et al.*, v. Citizens Utilities Company, *et al.*, (2000) Case No. CV 98-471, prepared expert report on behalf of a class of electricity customers relating to damage from inadequate electric service.

Before the United States District Court for the Southern District of Ohio -- Western Division

PepsiCo, Inc. v. Central Investment Corporation, (2000) Case No. C-1-98-389, prepared expert report on behalf of PepsiCo on economic issues relating to soft drink production and distribution.

Before the Corporation Commission of the State of Oklahoma

Joint Application of American Electric Power Company, Inc. Public Service Company of Oklahoma and Central and South West Corporation Regarding Proposed Merger, (1999) Cause No. PUD 980000444, prepared testimony on behalf of public power entities on merger-related market power issues.

Before the Pubic Service Commission of the State of Wisconsin

In the matter of Proposed Revision of Chapter PSC 100, Wis. Admin. Code – Rules for Wholesale Merchant Plants (1999) Docket No. 1-AC-174, prepared testimony on behalf of various intervenors concerning market power issues relating to merchant plant development.

Before the Corporation Commission of the State of Oklahoma

Report on Market Power Issues related to the Merger of American Electric Power Company and Central and South West Corporation (1998) Cause No. PUD 980000444, prepared expert report on behalf of the Municipal Electric Systems and Oklahoma Association of Electric Cooperatives.

Before the Mississippi Public Service Commission

Report on Retail Market Power Issues (1998) Docket No. 96-UA-389, prepared expert report on market power issues associated with electric utility restructuring in Mississippi on behalf of the Municipal Energy Agency of Mississippi.

Before the Connecticut Department of Public Utility Control

Review of the Connecticut Light & Power Company Rates and Charges (1998) Docket No. 98-01-02, prepared testimony and exhibits on cost allocation and rate design issues on behalf of the Connecticut Office of Consumer Counsel.

Before the Federal Energy Regulatory Commission

Western Resources, Inc., (1998); Docket No. ER98-2157-000, prepared affidavit on behalf of the Kansas City Board of Public Utilities addressing market power issues associated with Western Resources' application to sell wholesale power at market-based rates.

New England Electric Power Company, et al., (1998); Docket Nos. ER98-6-000 and EC98-1-000, prepared affidavit on behalf of the Town of Norwood addressing market power issues associated with the New England Power's sale of generating assets to U.S. Generating Company.

San Diego Gas & Electric Company, Enova Energy, Inc. (1997); Docket No. EC97-12-000, prepared affidavit on behalf of Southern California Public Power Authority addressing market power issues associated with the San Diego Gas & Electric/Southern California Gas merger.

The Cleveland Electric Illuminating Company and Market Responsive Energy, Inc. (1997); Docket Nos. ER96-372-000 and ER95-1295-000, respectively; prepared affidavit on behalf of Cleveland Public Power in opposition to CEI's and MREI's settlement offer to resolve market power issues in their filing under §206 of the Energy Policy Act to sell power at market-based rates.

In United States District Court for the District of Massachusetts

Town of Norwood, Massachusetts v. New England Power Company, *et al.* (1998) Case No. 97-CV10818-PBS, prepared affidavit on behalf of the Town of Norwood addressing antitrust issues associated with New England Power's sale of generating assets.

In United States District Court for the District of Massachusetts

Town of Norwood, Massachusetts v. New England Power Company, *et al.* (1998) Case No. 97-CV10818-PBS, prepared affidavit on behalf of the Town of Norwood addressing recent changes in the corporate organization of Pacific Gas & Electric Company pertinent to New England Power's sale of its generating assets to an affiliate of Pacific Gas & Electric Company.

Before the California Public Service Commission

Joint Application of Pacific Enterprises, Enova, *et al.* (merger of San Diego Gas & Electric Company and Southern California Gas Company, 1997); Application No. A96-10-038 prepared testimony on behalf of Southern California Public Power Authority addressing market power issues associated with the merger.

Before the Public Utilities Commission of Ohio

Application of the Toledo Edison Company and the Cleveland Electric Illuminating Company for authority to increase rates (1996); Case No. 95-299-EL-AIR and 95-300-EL-AIR; prepared testimony on cost allocation and rate design issues on behalf of the Ohio Office of Consumers' Counsel.

Before the South Carolina Public Service Commission

South Carolina Electric & Gas Company Application for Increases in Electric Rates and Charges (1995); Docket No. 95-1000-E; prepared testimony on behalf of the South Carolina Department of Consumer Affairs analyzing the Company's proposal to shift depreciation reserves and shorten amortization schedules in order to reduce the unrecovered costs of generation assets in preparation for retail competition.

Before the Public Service Commission of the District of Columbia

Application of the Potomac Electric Power Company for an Increase in its Retail Rates (1995); Formal Case No. 939; prepared testimony on cost allocation and rate design issues on behalf of the District of Columbia Office of People's Counsel.

Speeches

1. "Measuring Market Shares in the 'Energy Services' Market," presented at Communicating Competitive Concerns, sponsored by the American Gas Association, Arlington, VA, February 25, 1998.

2. "Hostile Takeovers in the Electric Utility Merger Wave," presented at Antitrust, Merger Guidelines, and Regulation of Utility Consolidation, sponsored by the Institute of Public Utilities at Michigan State University, Washington D.C., November 7, 1996.

3. "Telecommunications: Developing the Future at Home and Abroad," presented at The Future of Competition, sponsored by National Association of Regulatory Utility Commissioners, Columbus, OH, September 13, 1996.

4. "Economic Aspects of FERC's Policy on Electric Utility Mergers," presented at Mergers: A Threat to Competition?" sponsored by the McGraw-Hill Company, Washington, D.C., March 15, 1996.

Publications and Papers

ARTICLES

1. "Economies of Scope in Electric and Natural Gas Utilities," with K. Reutter, (July 2000) under review at *Applied Economics*

2. "An Empirical Model of Entry and Exit in Airline Markets," (October 1995) 10 *Review of Industrial Organization*

3. "Incremental Transmission Pricing, the Comparability Standard, and an Alternative to the FERC's 'Higher of' Policy," with D. F. Greer and J.W. Wilson (December 1994) *The Electricity Journal*

4. "Airport Dominance and State Action Antitrust Immunity for Airport Operators," (Fall 1991), 96 *Dickinson Law Review*

BOOK REVIEWS

5. "Designing Competitive Electricity Markets," by Hung-po Chao and Hillard G. Huntington (eds.), for the *Review of Industrial Organization* 2000.

6. "Power Structure - Ownership, Integration, and Competition in the U.S. Electric Utility Industry," by John Kwoka for the *Review of Industrial Organization*, 1998

7. "Electric Utility Mergers - Principles of Antitrust Analysis", by M. Frankena and B. Owens for the *Review of Industrial Organization*, 1994

8. "The Antitrust Revolution", by Kwoka and White for Harper Collins College Publishing, New York, NY, 1992

MICRONOMICS
AN INTECAP COMPANY

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Education

Doctor of Philosophy, Economics, 1997, Auburn University, AL

Master of Arts, Economics, 1992, University of Texas-Arlington

Bachelor of Science, Economics, 1988, University of Texas-Arlington

Fields of Concentration

Microeconomics, Industrial Organization, Regulation, and Econometrics

Expert Testimony

Before the Federal Energy Regulatory Commission

Egan Hub Partners, L.P., (2000); Docket No. CP96-199, prepared written testimony on behalf of Egan Hub Partners addressing market power issues for natural gas storage facilities in Louisiana and Texas.

Honors and Awards

Carthage Foundation Fellowship

Auburn Policy Research Center research grant recipient

Affiliations

American Bar Association

American Economic Association

National Association for Business Economics

Publications, Speeches, and Research

1. "Economies of Scope in Combination Electric and Natural Gas Utilities," with R. Sinclair, submitted to *Applied Economics*, July 2000.

2. "Electricity Substitution: Some local industrial evidence," with A. Barnett and H. Thompson, *Energy Economics*, vol. 20, issue 4, pp. 411-419 (Fall 1998).

3. "Power Pools vs. Bilateral Markets: A Survey," Auburn Policy Research Center monograph, summer 1996.

4. "Some Evidence of the Economic Impact of Government Contracted Research and Development," with A. Barnett and H. Thompson. Submitted to *Journal of Technology Transfer*.

5. Involved in research sponsored by NASA's Marshall Space Flight Center in Huntsville, AL, from 1995 to 1997. This research measured the economic impact of NASA's Small Business Innovation Research program and the resulting diffusion of technological innovation.

Teaching Experience

Assistant Professor of Economics and Finance (Adjunct), the University of Southern Indiana, Evansville, IN.

Instructor of Economics, Auburn University, Auburn, AL.

MICRONOMICS
AN INTECAP COMPANY

NELS A. PEARSALL, MANAGING DIRECTOR

CONSULTING EXPERIENCE

Mr. Pearsall has been engaged in economic research and consulting since 1989. He has worked as an economic consultant in Washington, D.C., where he managed groups and directed research for a broad range of antitrust matters, including private cases and matters before various government agencies. His antitrust experience includes attempted monopolization, analyses of entry, predatory pricing, price-fixing, price discrimination, and, very generally, the exercise of market power. In addition to economic analysis of liability issues, he has calculated damages associated with antitrust practices.

Mr. Pearsall has participated in matters involving the ownership of intellectual property rights including analyses of license agreements, determination of reasonable royalties and calculation of damages due to patent infringement. He has performed analyses of damage claims associated with securities fraud. He has participated in the development of offensive and defensive strategies for calculation of damages attributed to changes in stock prices following the disclosure of unanticipated information. Mr. Pearsall has analyzed anticipated competitive effects of mergers and acquisitions and has worked on behalf of merging parties. Mr. Pearsall also has participated in business consulting assignments related to the development and implementation of economic analyses.

EDUCATIONAL BACKGROUND AND SELECTED AFFILIATIONS

- Completed Graduate Studies for M.A., Economics (thesis pending), Virginia Polytechnic Institute and State University.
- B.A., Economics, Virginia Polytechnic Institute and State University

OTHER INFORMATION

Mr. Pearsall has worked on a variety of matters involving health care providers, medical-related devices, high-speed copiers, pharmaceuticals, collegiate and professional sports, retail grocery stores, baked goods, bicycle components, semiconductors, agricultural and aquacultural products, automobile parts, pet food and soft drinks.

Exhibit 4

High-Speed Services for Internet Access: Subscribership as of June 30, 2000

October 2000

Industry Analysis Division
Common Carrier Bureau
Federal Communications Commission
Washington, DC 20554

This publication is available for reference in the FCC's Information Center at 445 12th Street, S.W., Courtyard Level. Copies may be purchased by calling International Transcription Service, Inc. at (202) 857-3800. The publication can also be downloaded [file names: HSPD1000.ZIP, HSPD1000.PDF] from the **FCC-State Link** internet site at http://www.fcc.gov/ccb/stats on the World Wide Web.

High-Speed Services for Internet Access: Subscribership as of June 30, 2000

Congress directed the Commission and the states, in section 706 of the Telecommunications Act of 1996, to encourage deployment of advanced telecommunications capability in the United States on a reasonable and timely basis.[1] To assist in its evaluation of such deployment, the Commission launched a formal data collection program to gather standardized information about subscribership to high-speed services, including advanced services, from wireline telephone companies, cable providers, terrestrial wireless providers, satellite providers, and any other facilities-based providers of advanced telecommunications capability.[2]

Results from the first data collection, in which providers reported numbers of subscribers to high-speed services at the end of 1999, were presented in the Commission's second report to Congress on advanced telecommunications capability.[3] We summarize here comparable information from the second data collection, thereby presenting a snapshot of subscribership at mid-year 2000.[4] Subscribership to high-speed services for Internet access increased by 57% during the first half of 2000. At mid-year, the presence of high-speed service subscribers was reported in all fifty states, the District of Columbia, and Puerto Rico, and in about 70% of the zip codes in the United States.

Before presenting the new information in some detail, a brief description of the Commission's data collection program is in order to enable the reader to better understand how the nationwide information presented here may compare to similar information derived from other sources. First, a facilities-based provider of high-speed service lines (or wireless channels) in a given state reports to the Commission basic information about its service offerings and customers if the provider has at least 250 such lines in service in that state. While providers not meeting the reporting threshold may provide information on a voluntary basis, as some have done, we have no assurance that all such providers have reported data.[5] In particular, we do not know how comprehensively small providers, many of which serve rural areas

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[1] *See* §706, Pub.L. 104-104, Title VII, Feb. 8, 1996, 110 Stat. 153, reproduced in the notes under 47 U.S.C. §157. We define services as "high-speed" that provide the subscriber with transmissions at a speed in excess of 200 kilobits per second (kbps) in at least one direction. "Advanced services," which provide the subscriber with transmissions at a speed in excess of 200 kbps in each direction, are a subset of high-speed services.

[2] *Local Competition and Broadband Reporting*, CC Docket No. 99-301, Report and Order, 15 FCC Rcd 7717 (rel. March 30, 2000) (*Data Gathering Order*). The formal program followed several attempts by the Common Carrier Bureau to collect information on a voluntary basis. *See Local Competition and Broadband Reporting*, CC Docket No. 99-301, Notice of Proposed Rulemaking, 14 FCC Rcd 18106 (rel. Oct. 22, 1999).

[3] *Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion* , CC Docket No. 98-146, Second Report (rel. Aug. 21, 2000) (*Second Report on Advanced Telecommunications Capability*), available at http://www.fcc.gov/broadband. In the report, the Commission's data collection program (FCC Form 477) is referred to as the "Broadband Survey."

[4] Providers filed data for June 30, 2000 on September 1, 2000. During this data gathering program, qualifying providers will file FCC Form 477 each year on March 1 (reporting data for the preceding December 31) and September 1 (reporting data for June 30 of the same year). An updated FCC Form 477 for each specific round of the data collection may be downloaded from the FCC Forms website at http://www.fcc.gov/formpage.html.

[5] We received 84 state-specific voluntary submissions (made by 41 holding companies) in the first Form 477 filing and 78 voluntary submissions (made by 33 holding companies) in the second filing.

with relatively small populations, are represented in the data summarized here. Second, lines (or wireless channels) that do not meet the Commission's definition of "high-speed" (i.e., delivering transmissions to the subscriber at a speed in excess of 200 kbps in at least one direction) are not reported. Some asymmetric digital subscriber line (ADSL) services and Integrated Services Digital Network (ISDN) services provided by telephone companies and some services that connect subscribers to the Internet over cable systems do not meet this criterion, but may nevertheless meet the needs of the subscribers who select them.[6]

As the Commission's data collection program was only recently implemented, we expect providers to report data more accurately as they gain experience with the program. There also may be some need for further clarification and adjustment of the reporting system. Nevertheless, based on the information now available, the following broad conclusions emerge:

- Subscribership to high-speed services increased by 57% during the first half of 2000, to a total of 4.3 million lines (or wireless channels) in service.

- Considering services according to the technology deployed in the "last few feet" to the subscriber's premises, high-speed ADSL lines in service increased at the fastest rate during the six months, 157%, to almost one million lines.[7] High-speed lines in service over coaxial cable systems (cable modem service) remained more numerous, increasing 59% to a total of 2.2 million lines.[8] See Table 1.

[6] For example, based on a systematic, large scale personal interview survey, the Department of Commerce estimates that about 4.4% of the approximately 105 million U.S. households access the Internet at speeds faster than regular "dial-up" telephone lines. This implies about 4.6 million such Internet connections, compared to our estimate, discussed below, that about 3.1 million residences (and home office and other small business customers) connect to the Internet at speeds in excess of 200 kbps in at least one direction. The Department of Commerce notes that their survey results include lines that are slower than the Commission's definition of "high-speed." *See* U.S. Department of Commerce, *Falling Through the Net: Toward Digital Inclusion* (October 2000), available at http://www.esa.doc.gov/fttn00.pdf.

[7] Providers are instructed to report a high-speed subscriber in the (mutually exclusive) technology category that characterizes the last few feet of distribution plant to the subscriber's premises, e.g., coaxial cable in the case of the hybrid fiber-coax (HFC) architecture of upgraded cable systems. As noted above, ADSL services that do not deliver over 200 kbps in at least one direction are not included in the data reported here. Symmetric DSL services at speeds exceeding 200 kbps are included in the "other wireline" category because they are typically used to provide data services that are functionally equivalent to the T1 and other data services that wireline telephone companies have offered to business customers for some time.

[8] In addition, reported high-speed lines (or wireless channels) delivered over wireline technologies other than ADSL, fiber to the end-user's premises (e.g., Fiber-to-the-Home, or FTTH), satellite, and fixed wireless technologies increased by 18%. However, because of previously unidentified inconsistencies in reported data, we believe the true rate of increase is closer to 25%. (Based on discussions with reporting service providers, we believe year-end 1999 fiber lines are overstated by about 50,000 and "satellite & fixed wireless" channels by about 4,000.)

- Subscribership to the subset of high-speed services that the Commission defines as advanced services (i.e., delivering to subscribers transmissions at a speed in excess of 200 kbps in each direction) increased by 41% during the first half of 2000, to a total of 2.8 million lines (or wireless channels) in service. Advanced services lines provided by means of ADSL technology increased by 75%, and advanced services lines provided over coaxial cable systems increased by 63%.[9] See Table 2.

- As of June 30, 2000, there were about 3.1 million residential and small business subscribers to high-speed services. By contrast, there were approximately 1.8 million such subscribers at the end of 1999. See Table 3.

- Providers of high-speed ADSL services report serving subscribers in 49 states and the District of Columbia, while providers of high-speed services over cable systems report serving subscribers in 47 states and the District of Columbia. High-speed service providers who use wireline technologies other than ADSL, optical carrier (i.e., fiber), satellite, or fixed wireless technologies in the last few feet to the subscriber's premises report serving subscribers in all fifty states, the District of Columbia, and Puerto Rico.[10] See Table 4.

- The Commission's data collection program uniquely gathers from providers information about the number of high-speed lines in service in individual states, in total and by technology deployed in the last few feet to the subscriber's premises. Relatively large numbers of total high-speed lines in service are associated with the more populous states.[11] See Table 5.

- The Commission's data collection program also requires service providers to identify each zip code in which the provider has at least one high-speed subscriber. As of June 30, 2000, subscribers to high-speed services were reported in about 70% of the nation's zip codes. Multiple providers reported having subscribers in more than 40% of the nation's zip codes.[12] See Table 6.

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[9] Similarly to the situation for high-speed lines, discussed above, we believe year-end 1999 advanced services lines (or wireless channels) provided over fiber to the end-user's premises and over "satellite & fixed wireless" technology are somewhat overstated due to previously unidentified inconsistencies in the reported data.

[10] This information is reported in a single category, for the individual states, to honor requests for nondisclosure of information that reporting entities assert is competitively sensitive. In the *Data Gathering Order*, the Commission agreed to publish high-speed data only once it has been aggregated in a manner that does not reveal individual company data. *See Data Gathering Order*, 15 FCC Rcd 7760. The Commission is optimistic that this approach will encourage providers that fall below the threshold for mandatory reporting of high-speed subscribership information to participate on a voluntary basis in future rounds of the data collection.

[11] The most populous state, California, has the largest reported number of high-speed lines. The second and third largest numbers of high-speed lines are reported for New York and Texas, which are the third and second most populous states, respectively.

[12] A list of zip codes with number of service providers as reported in the first Form 477 filing (data as of December 31, 1999) is available at http://www.fcc.gov/ccb/stats. Lists from subsequent filings will be posted when available.

- Our analysis indicates that about 95% of the country's population lives in the 70% of zip codes where a provider reports having at least one high-speed service subscriber.[13] Moreover, numerous competing providers report serving high-speed subscribers in the major population centers of the country. See Figure 1.

- In each of California, Massachusetts, and the District of Columbia, at least one-fifth of zip codes have seven or more providers that report having at least one subscriber for high-speed service in the zip code. By contrast, 3% of nationwide zip codes have seven or more such providers. See Table 7.

- High population density has a positive correlation with reports that high-speed subscribers are present, and low population density has a negative correlation. For example, as of June 30, 2000, high-speed subscribers are reported to be present in 96% of the most densely populated zip codes and in 40% of zip codes with the lowest population densities.[14] However, the number of sparsely populated zip codes with high-speed subscribers increased by 69% during the first half of this year, compared to an increase of 4% for the most densely populated zip codes. See Table 8.

- High median family income also has a positive correlation with reports that high-speed subscribers are present. In the top one-tenth of zip codes ranked by median family income, high-speed subscribers are reported in 95% of zip codes. By contrast, high-speed subscribers are reported in only 51% of zip codes with the lowest median family income. See Table 9.

As other information from the Commission's data collection program (FCC Form 477) becomes available, it will be included in future reports on the deployment of advanced telecommunications capability and in publications such as this one.

We invite users of this information to provide suggestions for improved data collection and analysis by:

- Using the attached customer response form,
- E-mailing comments to eburton@fcc.gov,
- Calling the Industry Analysis Division at (202) 418-0940, or
- Participating in any formal proceedings undertaken by the Commission to solicit comments for improvement of FCC Form 477.

[13] We note that some providers have not strictly followed instructions to report zip codes in which a high-speed subscriber is present and have reported, for example, all zip codes within the boundary of a "wire center" that serves at least one high-speed subscriber.

[14] For this comparison, we consider the most densely populated zip codes to be those with more than 268 persons per square mile (the top three deciles), and the least densely populated zip codes to be those with fewer than 25 persons per square mile (the bottom three deciles).

Table 1
High-Speed Lines
(Over 200 Kbps in at Least One Direction)

Types of Technology*	December 1999	June 2000	% Change
ADSL	369,792	950,590	157%
Other Wireline	609,909	747,028	22
Coaxial Cable	1,414,183	2,248,981	59
Fiber	312,204	307,151	n.m.
Satellite & Fixed Wireless	50,404	65,615	n.m.
Total Lines	2,756,492	4,319,365	57%

Table 2
Advanced Services Lines
(Over 200 Kbps in Both Directions)

Types of Technology*	December 1999	June 2000	% Change
ADSL	185,950	325,901	75%
Other Wireline	609,909	747,028	22
Coaxial Cable	879,671	1,434,237	63
Fiber	307,315	301,551	n.m.
Satellite & Fixed Wireless	7,816	3,649	n.m.
Total Lines	1,990,662	2,812,366	41%

Table 3
Residential and Small Business High-Speed Lines
(Over 200 Kbps in at Least One Direction)

Types of Technology*	December 1999	June 2000	% Change
ADSL	291,757	771,311	164%
Other Wireline	46,856	104,647	123
Coaxial Cable	1,404,600	2,179,749	55
Fiber	1,023	325	n.m.
Satellite & Fixed Wireless	50,404	64,320	n.m.
Total Lines	1,794,640	3,121,653	74%

*The mutually exclusive types of technology are, respectively: Asymetric digital subscriber line (ADSL) technologies, which provide speeds in one direction greater than speeds in the other direction; wireline technologies "other" than ADSL, including traditional telephone company high-speed services and symmetric DSL services that provide equivalent functionality; coaxial cable, including the typical hybrid fiber-coax (HFC) architecture of upgraded cable TV systems; optical fiber to the subscriber's premises (e.g., Fiber-to-the-Home, or FTTH); and satellite and (terrestrial) fixed wireless systems, which use radio spectrum to communicate with a radio transmitter at the subscriber's premises.

n.m.: Not meaningful due to previously unidentified inconsistencies in reported data.

Table 4
High-Speed Providers by Technology as of June 30, 2000

	ADSL	Coaxial Cable	Other #	All Broadband (Unduplicated)
Alabama	*	6	5	11
Alaska	0	0	*	*
Arizona	*	*	7	7
Arkansas	*	*	4	6
California	8	8	17	22
Colorado	*	*	9	10
Connecticut	*	4	7	10
Delaware	*	*	4	5
District of Columbia	*	*	8	8
Florida	5	8	11	16
Georgia	*	4	8	12
Hawaii	*	*	*	*
Idaho	*	*	*	4
Illinois	6	4	10	13
Indiana	*	4	7	11
Iowa	*	6	6	9
Kansas	*	*	6	7
Kentucky	4	*	5	8
Louisiana	*	*	5	7
Maine	*	*	*	4
Maryland	*	4	8	11
Massachusetts	4	4	12	15
Michigan	*	5	9	13
Minnesota	4	7	8	16
Mississippi	*	*	*	5
Missouri	*	4	9	11
Montana	*	*	*	*
Nebraska	*	*	5	6
Nevada	*	*	7	8
New Hampshire	*	*	6	6
New Jersey	*	*	10	11
New Mexico	*	0	4	4
New York	8	*	13	19
North Carolina	5	4	7	12
North Dakota	*	*	4	6
Ohio	6	*	14	15
Oklahoma	*	*	*	5
Oregon	4	*	9	10
Pennsylvania	7	4	15	18
Puerto Rico	0	0	*	*
Rhode Island	*	*	*	4
South Carolina	*	4	6	9
South Dakota	*	*	5	5
Tennessee	*	*	5	10
Texas	7	4	14	17
Utah	*	*	5	6
Vermont	*	*	*	4
Virginia	5	4	14	16
Washington	8	*	12	15
West Virginia	*	*	*	4
Wisconsin	6	*	8	11
Wyoming	*	0	*	*
Nationwide (Unduplicated)	45	33	69	106

Other includes other wireline, fiber, satellite and fixed wireless.

* Indicates 1-3 providers reporting.

Table 5
High-Speed Lines by Technology

	December 1999	June 2000				
	Total	ADSL	Coaxial Cable	Other #	Total	Percentage Change from 1999 to 2000
Alabama	19,796	*	17,164	*	32,679	65 %
Alaska	*	0	0	*	*	n.a.
Arizona	58,825	*	*	48,983	111,678	90
Arkansas	8,155	*	*	3,688	15,484	90
California	547,179	373,574	297,415	238,700	909,689	66
Colorado	36,726	*	*	13,127	64,033	74
Connecticut	36,488	*	47,127	*	63,772	75
Delaware	1,558	*	*	1,506	3,660	135
District of Columbia	13,288	*	*	10,766	16,926	27
Florida	190,700	37,806	127,238	75,851	240,895	26
Georgia	75,870	*	48,947	*	130,292	72
Hawaii	*	*	*	*	*	n.a.
Idaho	*	*	*	*	8,070	n.a.
Illinois	77,672	12,812	83,737	70,384	166,933	115
Indiana	20,059	*	33,431	*	49,599	147
Iowa	19,258	*	42,081	*	49,159	155
Kansas	26,179	*	*	5,171	42,679	63
Kentucky	23,570	*	*	*	24,019	2
Louisiana	28,133	*	*	11,749	43,294	54
Maine	19,878	*	*	*	17,864	-10
Maryland	52,749	*	42,412	*	71,005	35
Massachusetts	114,116	15,802	148,233	19,922	183,957	61
Michigan	81,223	*	94,586	*	135,318	67
Minnesota	38,268	25,975	30,485	8,375	64,835	69
Mississippi	*	*	*	*	6,514	n.a.
Missouri	23,347	*	16,482	*	46,903	101
Montana	*	*	*	*	*	n.a.
Nebraska	36,748	*	*	5,609	44,184	20
Nevada	23,514	*	*	10,441	40,582	73
New Hampshire	22,807	*	*	2,580	33,045	45
New Jersey	101,832	*	*	36,909	144,203	42
New Mexico	*	*	0	*	2,925	n.a.
New York	186,504	41,576	*	*	311,839	67
North Carolina	57,881	8,662	42,290	30,158	81,110	40
North Dakota	*	*	*	1,632	3,467	n.a.
Ohio	160,792	33,603	*	*	156,888	-2
Oklahoma	*	*	*	*	162,790	n.a.
Oregon	27,062	19,989	*	*	44,186	63
Pennsylvania	71,926	18,313	38,340	23,239	79,892	11
Puerto Rico	*	0	0	*	*	n.a.
Rhode Island	*	*	*	*	20,628	n.a.
South Carolina	25,229	*	20,190	*	32,824	30
South Dakota	*	*	*	5,414	7,991	n.a.
Tennessee	66,307	*	*	23,979	85,500	29
Texas	152,518	73,117	135,999	65,014	274,130	80
Utah	11,635	*	*	4,828	19,612	69
Vermont	*	*	*	*	1,551	n.a.
Virginia	51,305	9,510	40,337	22,153	72,000	40
Washington	71,930	52,345	*	*	118,318	64
West Virginia	*	*	*	*	1,835	n.a.
Wisconsin	18,599	1,063	*	*	34,220	84
Wyoming	*	*	0	*	*	n.a.
Nationwide Reported Total	2,756,492	950,590	2,248,981	1,119,794	4,319,365	57

Other includes other wireline, fiber, satellite and fixed wireless.

* Data witheld to maintain firm confidentiality.

n.a.: Not available

Table 6
Percentage of Zip Codes with High-Speed Service

Providers	December 1999	June 2000
Zero	44.0 %	30.1 %
One	24.5	27.8
Two	14.2	18.6
Three	8.1	9.3
Four	4.4	5.0
Five	2.6	3.4
Six	1.5	2.6
Seven	0.6	1.7
Eight	0.2	0.9
Nine	0.0	0.4
Ten or More	0.0	0.4

Figure 1
High-Speed Providers by Zip Code

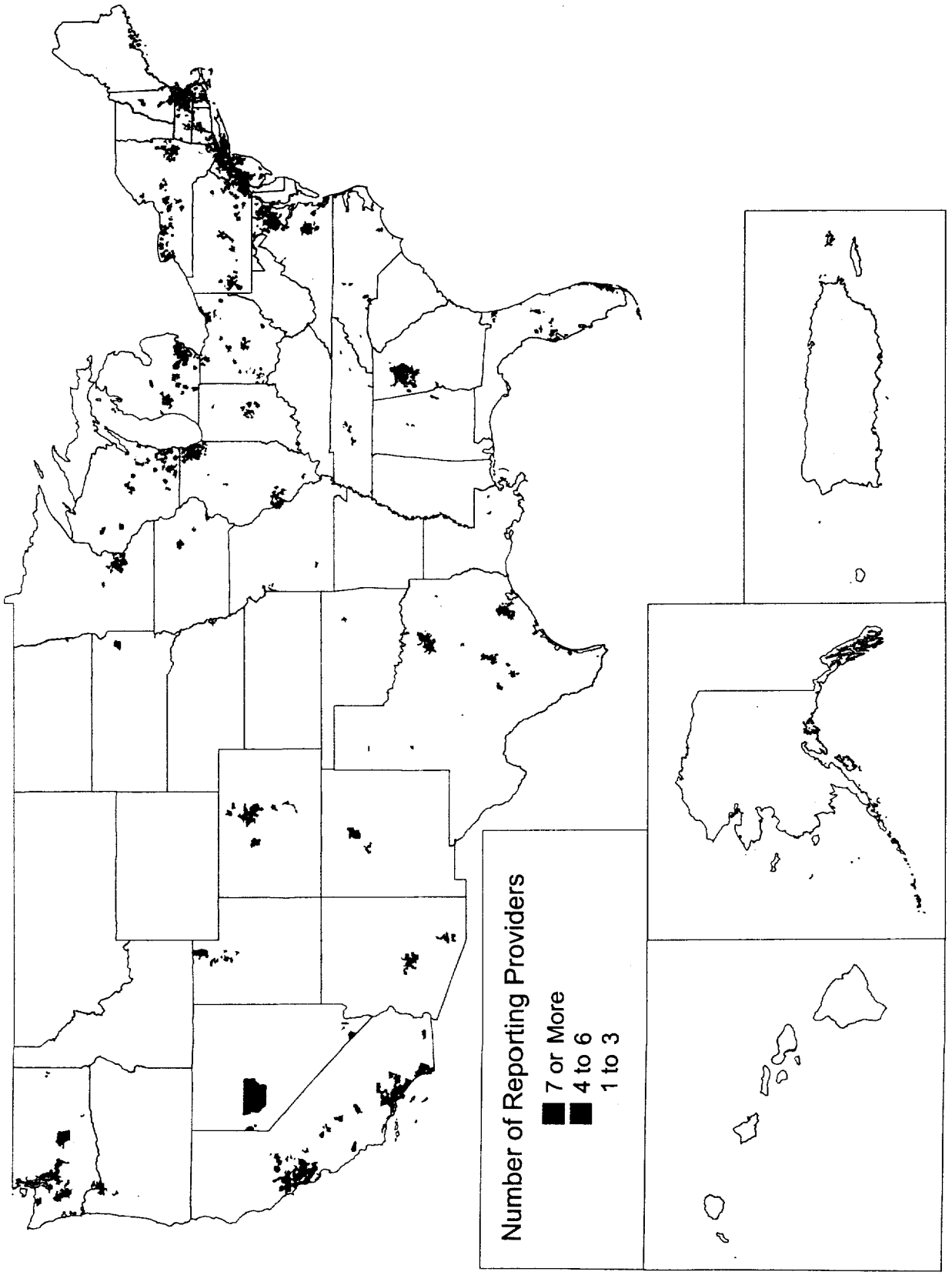

Table 7
Percentage of Zip Codes with High-Speed Lines as of June 30, 2000

	Number of Providers					
	Zero	One - Three	Four	Five	Six	Seven or More
Alabama	38 %	61 %	1 %	0 %	0 %	0 %
Alaska	78	22	0	0	0	0
Arizona	14	50	8	11	13	4
Arkansas	66	34	0	0	0	0
California	17	40	7	7	8	20
Colorado	13	63	5	6	6	8
Connecticut	8	69	17	4	3	0
Delaware	0	98	2	0	0	0
District of Columbia	0	33	4	11	26	26
Florida	12	62	9	8	4	4
Georgia	34	49	6	5	3	3
Hawaii	49	51	0	0	0	0
Idaho	31	69	0	0	0	0
Illinois	39	44	7	5	2	2
Indiana	35	60	4	1	0	0
Iowa	41	58	1	0	0	0
Kansas	50	50	0	0	0	0
Kentucky	55	45	0	0	0	0
Louisiana	39	59	1	0	0	0
Maine	30	70	0	0	0	0
Maryland	1	68	8	9	9	5
Massachusetts	1	49	14	5	5	26
Michigan	18	64	6	6	4	3
Minnesota	33	57	5	4	1	0
Mississippi	47	53	0	0	0	0
Missouri	57	36	3	3	1	0
Montana	49	51	0	0	0	0
Nebraska	48	48	4	0	0	0
Nevada	26	59	11	3	0	0
New Hampshire	5	85	4	5	0	0
New Jersey	2	51	21	14	7	5
New Mexico	33	62	5	0	0	0
New York	11	62	8	7	5	6
North Carolina	24	73	2	1	0	0
North Dakota	59	41	1	0	0	0
Ohio	19	69	7	3	1	0
Oklahoma	58	40	3	0	0	0
Oregon	23	66	4	4	2	2
Pennsylvania	25	56	7	4	5	2
Puerto Rico	15	85	0	0	0	0
Rhode Island	0	81	19	0	0	0
South Carolina	35	65	0	0	0	0
South Dakota	41	58	1	0	0	0
Tennessee	34	63	2	0	0	0
Texas	33	49	5	4	4	5
Utah	20	64	9	8	0	0
Vermont	8	92	0	0	0	0
Virginia	25	59	3	2	4	7
Washington	20	52	6	6	7	9
West Virginia	25	75	0	0	0	0
Wisconsin	34	54	8	4	1	0
Wyoming	26	74	0	0	0	0
Nationwide	30	56	5	3	3	3

Table 8
High-Speed Subscribership in Zip Codes
Ranked by Population Density

Deciles (blocks of zip codes grouped by density)	Persons per square mile (in each decile of zip codes)	% of zip codes in decile with at least one high-speed subscriber		% of population in decile that reside in zip codes with high speed service	
		December 1999	June 2000	December 1999	June 2000
90-100	More than 3,147	96.2	97.6	99.0	99.7
80-90	947-3,147	93.2	96.0	98.4	99.4
70-80	268-947	87.2	93.6	96.2	98.4
60-70	118-268	77.8	87.2	91.7	96.2
50-60	67-118	66.3	78.7	82.9	90.4
40-50	41-67	53.7	66.9	72.2	82.1
30-40	25-41	40.2	56.8	59.1	73.0
20-30	15-25	27.9	44.7	48.5	63.4
10-20	6-15	23.9	38.9	46.6	61.6
0-10	less than 6	18.7	35.4	36.1	56.4

Table 9
High-Speed Subscribership in Zip Codes
Ranked by Median Household Income

Deciles (blocks of zip codes grouped by median household income)	Median household income (in each decile of zip codes)	% of zip codes in decile with at least one high-speed subscriber		% of population in decile that reside in zip codes with high speed service	
		December 1999	June 2000	December 1999	June 2000
90-100	$53,494 to $291,938	90.8	95.4	98.4	99.5
80-90	$43,617 to $53,478	77.4	86.9	95.9	98.2
70-80	$38,396 to $43,614	67.0	78.1	94.3	96.8
60-70	$34,744 to $38,395	59.6	73.6	91.7	95.6
50-60	$32,122 to $34,743	53.7	68.3	89.4	93.9
40-50	$29,893 to $32,121	51.8	65.0	88.2	92.7
30-40	$27,542 to $29,892	49.1	62.4	85.9	91.4
20-30	$24,855 to $27,541	48.8	59.6	85.1	90.3
10-20	$21,645 to $24,855	45.3	55.7	82.5	88.1
0-10	$0 to $21,644	41.7	50.5	84.1	89.5

Customer Response

Publication: High-Speed Services for Internet Access: Subscribership as of June 30, 2000

You can help us provide the best possible information to the public by completing this form and returning it to the Industry Analysis Division of the FCC's Common Carrier Bureau.

1. Please check the category that best describes you:
   - ____ press
   - ____ current telecommunications carrier
   - ____ potential telecommunications carrier
   - ____ business customer evaluating vendors/service options
   - ____ consultant, law firm, lobbyist
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2.

Please rate the report:	Excellent	Good	Satisfactory	Poor	No opinion
Data accuracy	(_)	(_)	(_)	(_)	(_)
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